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IDENTIFICATION OF SEEDS OF *HYDNOCARPUS* AND *GYNOCARDIA* (FLACOURTIACEAE)

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ABSTRACT

The paper presents a morphological study of the seeds of 4 species of *Hydnocarpus* Gaertn. and the one species of *Gynocardia* R. Br. along with a key to the species on the basis of the characteristics of seeds which are commercially exploited. Original citations, important synonymy, reference to Indian literature on the taxa and their districtwise occurrence in India, their distribution and fruiting time are given.

Difficulties are often faced in identifying seeds used in commerce with the help of meagre description of seeds available in literature. Seeds sent by traders for determination are often found to be mixed with seeds of apparently similar external morphological appearance. Careful examination has revealed that the external and internal morphological characters can safely be used in identifying the desirable one from among the mixture with others.

The genera *Hydnocarpus* Gaertn. and *Gynocardia* R. Br. of Flacourtiaceae comprising 41 species (Sleumer 1938, 1958) are distributed in the Indo-Malayan regions. 7 species of the former and the single species of the latter are found in India (Santapau & Henry 1973). Seeds of 4 species of the genus *Hydnocarpus*, namely *H. alpina* Wight, *H. kurzii* (King) Warb., *H. pentandra* (F. Ham.) Oken and *H. venenata* Gaertn., the 'Chaulmoogra' are largely exploited. But *H. kurzii* is the true 'Chaulmoogra' of commerce used in cutaneous diseases (Chopra 1933 ; Chopra *et al.* 1956 ; Sastri *et al.* 1959). Seeds of *Gynocardia odorata* R. Br. also known as 'Chaulmoogra' at certain places are mixed with those of *H. kurzii* as they are apparently very similar. The oil of seeds of *G. odorata* differs from Chaulmoogra oil in having no Chaulmoogric and Hydnocarpic acid and thus having no therapeutic value (Sastri *et al.* 1956).

Seeds of *G. odorata* are developed from amphitropous ovules i.e. micropyle and hilum are at a right angle while seeds of *Hydnocarpus* are developed from orthotropous ovules i.e. micropyle is situated opposite to hilum. They also differ in having thick and leafy, veinless cotyledons. Similarly seeds of different species of *Hydnocarpus* differ in shape, presence or absence of aril on hilum, striations of testa and number of veins of cotyledons. It is considered that the number of veins of the cotyledons would provide a practical working key for diagnosing the species of *Hydnocarpus*, since it is a macro-character. Seeds in both the genera are, however, provided with large endosperm and the seed coats are differentiated into testa and tegmen. (Plate I).

Key to the species on the characters of the seeds

1. Seeds developed from orthotropous ovules; micropylar region not demarcated; cotyledons leafy, 3-5-veined :
  2. Seeds pebble-like; hilum not arillate ... *Hydnocarpus kurzii*
  2. Seeds not pebble-like; hilum arillate :
    3. Testa without longitudinal striations ; aril linear-oblong ... *H. alpina*
    3. Testa with longitudinal striations ; aril bulbous :

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4. Endosperm nippled at the hilar region; cotyledons 5-veined ... *H. pentandra*
4. Endosperm pointed at the hilar region; cotyledons 3-veined ... *H. venenata*
1. Seeds developed from amphitropous ovules; micropylar region wide, well demarcated; cotyledons thick, without veins ... *Gynocardia odorata*

Important characters of the seeds along with districtwise occurrence, distribution, fruiting time and local names of the species are given below.

1. **Gynocardia odorata** R. Br. in Roxb. Cor. Pl. 95. t. 299. 1820; Hook. f. & Thoms. in Hook. f. Fl. Brit. Ind. 1: 195. 1872; Watt, Dict. Econ. Prod. India 4: 192. 1890; Kanjilal *et al.* Fl. Assam 1(1): 87. 1934; Sastri *et al.* Wealth of India (Raw Mat.) 4: 280. 1956. (Fig. 1).

Local names: Kusthapa in Sanskrit; Chalmoogra and Chaulmoogra in Bengali and Marathi; Bonsha and Lemtem in Assamese; Diangsohliang in Khasi and Balibu and Masribu in Garo.

Seeds 2.4-2.8 × 1.75-2.0 cm, variable in shape, usually obovoid or oblong, irregular by compressions; pale brown in colour; hilar region occupying about half of the surface, demarcated by glabrousness from the rest. Micropyle lateral, at a right angle to the hilum. Cotyledons 1.3-1.8 × 0.8-1.1 cm, blackish-brown, thick, triquetrous, without veins; radicle 0.1-0.2 cm long, blackish-brown, lateral.

Fruiting time: November to December.

Occurrence: Gangtok in Sikkim; Darjeeling and Jalpaiguri in West Bengal; Lohit, Subansiri and Siang in Arunachal; Lakhimpur and Nowgong in Assam; Tlangsang and Phuldungsai in North Tripura; West Manipur; Chittagong in Bangladesh; Bhutan and Burma.

Distribution: Foot hills of Eastern Himalayas from Bhutan to Arunachal and Bangladesh to Burma.

2. **Hydnocarpus alpina** Wight, Icon. t. 942. 1845; Bedd. Fl. Sylvat. 77. 1869; Hook. f. & Thoms. in Hook. f. Fl. Brit. Ind. 1: 197. 1872; Watt, Dict. Econ. Prod. India 4: 308. 1890; Gamble, Fl. Pres. Madras 1: 52. 1915; Sastri *et al.* Wealth of India (Raw Mat.) 5: 140. 1959. (Fig. 2).

Local names: Kastel in Marathi; Attuchankalai in Tamil; Tarathi and Sanuasolti in Kanadi and Malaravatti in Malayalam.

Seeds 1.5-2.0 × 1.3-1.7 cm; elliptic-oblong or sub-globose with irregular compressions, deep brown in colour with blackish patches and irregular ridges. Aril membranous, linear-oblong. Micropyle just opposite to hilum which is distinct from other region by its wrinkled nature. Cotyledons 0.7-0.8 × 0.5-0.6 cm, leafy, yellowish-brown, ovate, with 3 prominent veins; radicle 0.4-0.5 cm long, deep brown, terminal.

Fruiting time: October to April.

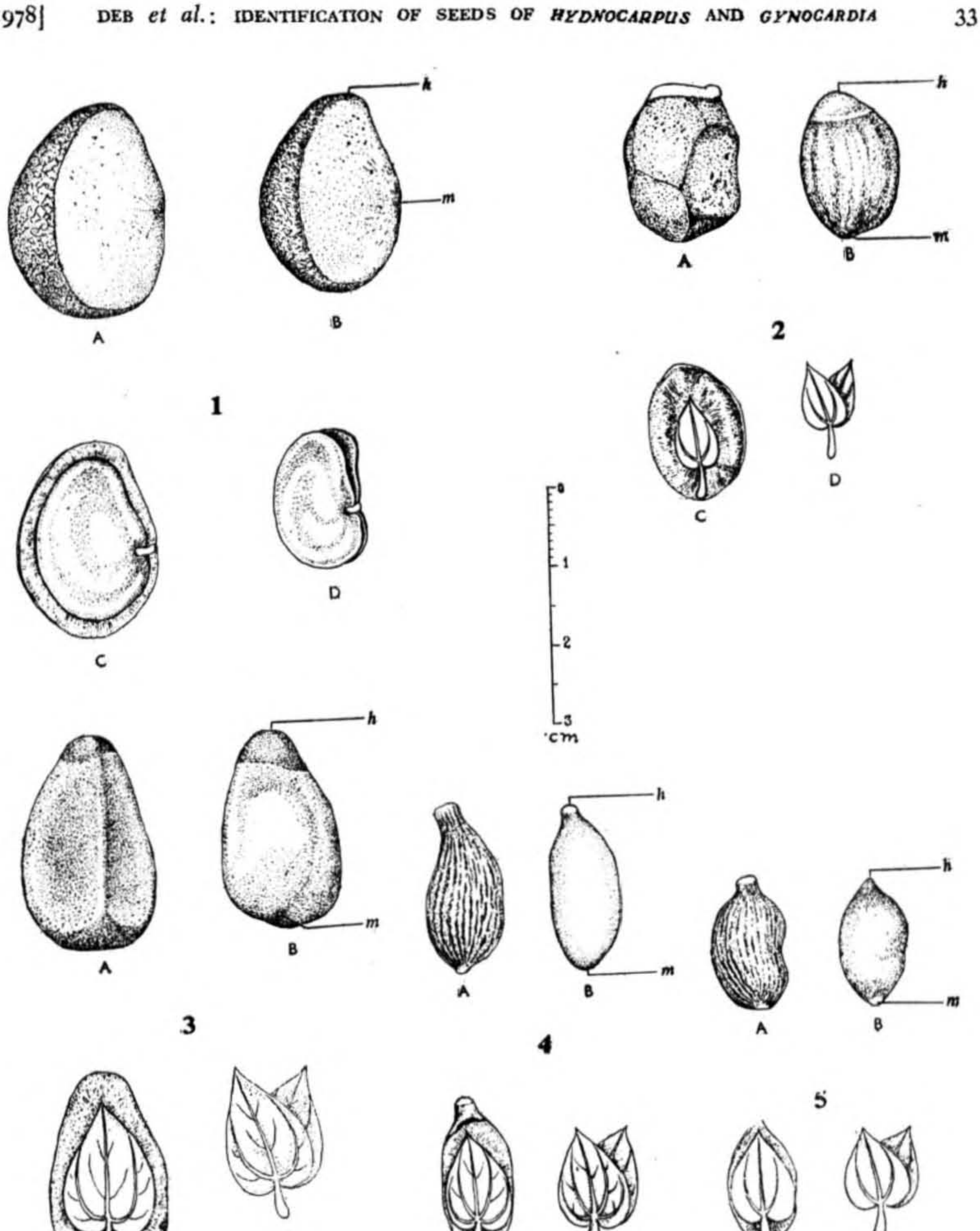
Occurrence: Anammalai and Nilgiri in Tamilnadu, Travancore and Bombay.

Distribution: Maharastra to Tamilnadu and Sri Lanka.

3. **H. kurzii** (King) Warb. in Engl. & Prantl, Pflanzenfam. 3(6a): 21. 1894; Kanjilal *et al.* Fl. Assam 1(1): 87. 1934; Sastri *et al.* Wealth of India (Raw Mat.) 5: 141. 1959; Deb in Bull. bot Surv. India 3: 280. 1961. *Taraktogenos kurzii* King in Journ. Asiat. Soc. Bengal 69(2): 123. 1890. (Fig. 3).

Local names: Lamtem in Assamese; Diang-soh-lap in Khasi; Balibu in Garo; Matta in Lushai and Tripuri; Uhon in Manipuri; Dalmugri and Chaulmugra in Bengali; Chaulmoogra in Marathi and Hindi and Niradi-mutu in Tamil.

Seeds 2.2-3.2 × 1.6-2.0 cm; pebble-like, variable in shape, usually angular-ovoid, irregular by compressions, light brown in colour, glabrous throughout. Micropyle opposite to the hilum. Endosperm at the hilar region is darker in colour. Cotyledons 1.2-1.5 × 1.1-1.3 cm, heart-shaped, leafy, deep brown, with 3 prominent veins; radicle 0.5-0.7 cm long, tip little bent on one side towards the micropyle.



Figs. 1-5 : 1 *Gynocardia odorata*. 2. *Hydnocarpus alpina*. 3. *H. kurzii*. 4. *H. pentandra*. 5. *H. venenata*. (A. A seed with seed coat; B. Seed after removing testa and tegmen; C. L. S. of seed showing the position of radicle and cotyledons inside the endosperm; D. Cotyledons with radicle; h. hilum and m. micropyle.)

Fruiting time: November to March rarely September to July.

Occurrence: Sibsagar in Assam; North Tripura; Central Manipur; Mizoram; Dehra Dun in Uttar Pradesh; North Kanara, Quilon, Cochin and Malabar; Chittagong in Bangladesh and Burma.

Distribution: From Uttar Pradesh in the north to Manipur, Bangladesh and Burma in the east, Maharastra in the west and to Kerala in the south.

4. **H. pentandra** (F. Ham.) Oken, Allg. Naturgesch. 3(2): 1381. 1841; Mukherjee in Bull. bot. Surv. India 14: 183. 1972. *Chilmoria pentandra* F. Ham. in Trans. Linn. Soc. 13: 501. 1822. *Hydnocarpus laurifolia* (Dennst.) Sleum. in Bot. Jahrb. 69: 33. 1938, nom. illegit; Sastri *et al.* Wealth of India (Raw Mat.) 5: 142. 1959. *H. wightiana* Bl. Rumph. 4: 22. 1848; Hook. f. & Thoms. in Hook. f. Fl. Brit. Ind. 1: 196. 1872. Gamble, Fl. Pres. Madras 1: 52. 1915. (Fig. 4).

Local names: Garudaphala, Tuvrak in Sanskrit; Chaulmoogra in Hindi; Kobased, Kadukavata, Katu-kavath, Kastil, Kete, Kantel, Kowti in Marathi: Adibadam, Niradi in Telegu; Marvatti, Niradi-muttu in Tamil; Koratti, Surti, Suranti in Kanadi; Kodi, Koti, Maravatti, Maroti, Niralam, Nirivetti, Tamana and Vatti in Malayalam and Kanti, Kava in Maharastra.

Seeds 1.7-2.2 × 1.0-1.5 cm, variable in shape, usually obovoid, irregular by compression, narrower towards the hilum; testa deep yellow, striated. Aril on the hilum is bulbous. Micropyle just opposite to the hilum, no distinctive mark on the hilar region from the rest. Endosperm on the hilar region nippled. Cotyledons 1.0-1.2 × 0.9-1.9 cm, leafy, deep brown, ovate-oblong, with 5 prominent veins; radicle 0.3-0.5 cm long, deep brown.

Fruiting time: June to September.

Occurrence: S. Kanara; Trichur, Coimbatore in Tamilnadu; Travancore and Bombay.

Distribution: Maharastra to Tamilnadu and Kerala.

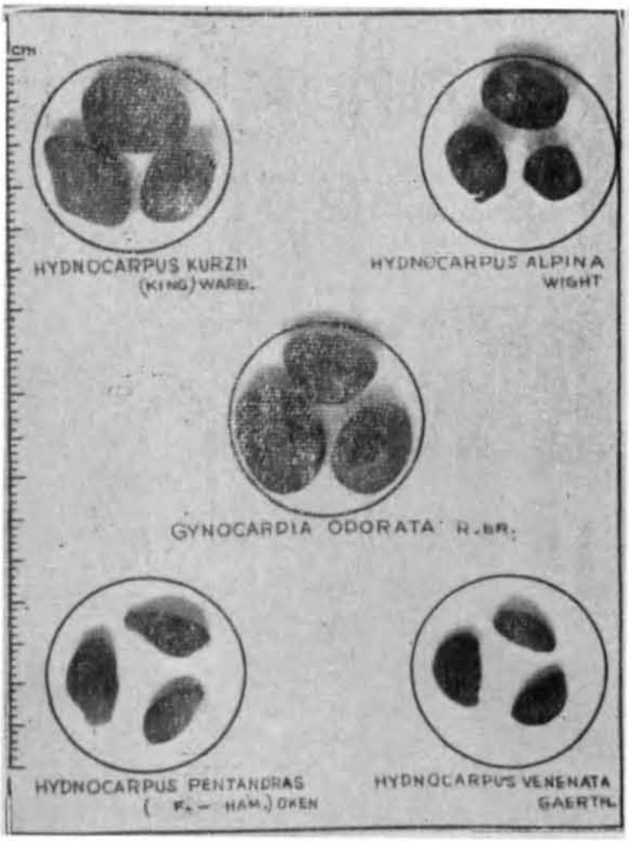

cm
HYDNOCARPUS KURZII (KING) WARB.
HYDNOCARPUS ALPINA WIGHT
GYNOCARDIA ODORATA R. BR.
HYDNOCARPUS PENTANDRAS (F. - HAM.) OKEN
HYDNOCARPUS VENENATA GAERTN.

Plate I. Photograph showing differences in the seeds of *Gynocardia odorata* and species of *Hydnocarpus*.

H. venenata Gaertn. Fruct. 1: 288. t. 60, f. 3. 1788; Bl. Mus. Bot. 1: 18. 1849; Hook. f. & Thoms. in Hook. f. Fl. Brit. Ind. 1: 196. 1872; Watt, Dict. Econ. Prod. India 4: 308. 1890. (Fig. 5).

Local names: Jangli-badam in Hindi; Kauti in Marathi; Niridimuttu in Tamil and Niruduvittulu in Telegu.

Seeds 1.5-1.8 × 0.9-1.1 cm; variable in shape, usually elliptic or obovoid, irregular by compression, narrower towards the hilum; deep brown: testa striated. Aril bulbous. Micropyle just opposite to the hilum. Endosperm light brown and pointed at the hilum. Cotyledons 1.0 × 1.0 cm, light brown; leafy with 3 distinct veins: radicles 0.4-0.5 cm long, light brown.

Fruiting time: May-July.

Occurrence: Cultivated in Indian Botanic Garden, Howrah.

Distribution: Sri Lanka. The report that it occurs in South India and Burma (Watt 1809, 1909) appears to be erroneous (Sastri *et al.* 1959) probably due to misidentification.

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